

Evaluating Ecosystem Restoration in the Corps of Engineers:

Cost Effectiveness & Incremental Cost Analysis

Shana Heisey

Institute for Water Resources

What are CE/ICA?

Cost Effectiveness & Incremental Cost Analysis:

**Tools to inform environmental
investment decision-making.**

Why CE/ICA?

- Project level analysis
 - Choosing efficient alternatives at individual projects
 - Not evaluating programmatic or policy implications
- By COE policy, environmental benefits are NOT monetized

Why CE/ICA?

- COE culture:
 - Long history w/ economic justification of NED projects
 - Engineering organization- science-based, number friendly
- Mitigation projects
- Timely appointment of Economist in ASA office

The climate was right

Corps CE/ICA Timeline

Mitigation

Rudimentary
ICA Guidance

Restoration

Kissimmee
ICA attempt

Everglades;
Intelligible
Guidance

Software
Eco-Easy
IWR-PLAN

EVE

Early
1980's

Mid
1980's

Late
1980's

Early
1990's

Mid
1990's

Late
1990's

Early
2000's

The Concepts non-monetary outputs

- Environmental benefit unit
 - Ideally measure of quality and quantity of output
 - Physical dimensions, population counts, diversity index
- Flexible guidance on methodology
 - HEP, IBI, HGM, “homegrown”
- Not everything quantified
 - Significance, story telling

The Concepts

- Cost Effectiveness:
 1. No other plan provides the *same output* for *less cost*
 2. No other plan provides a *higher output* level for the *same or less cost*
- Incremental Cost Analysis
 1. Greatest increase in output for least increase in cost
 2. Lowest incremental costs per unit of output

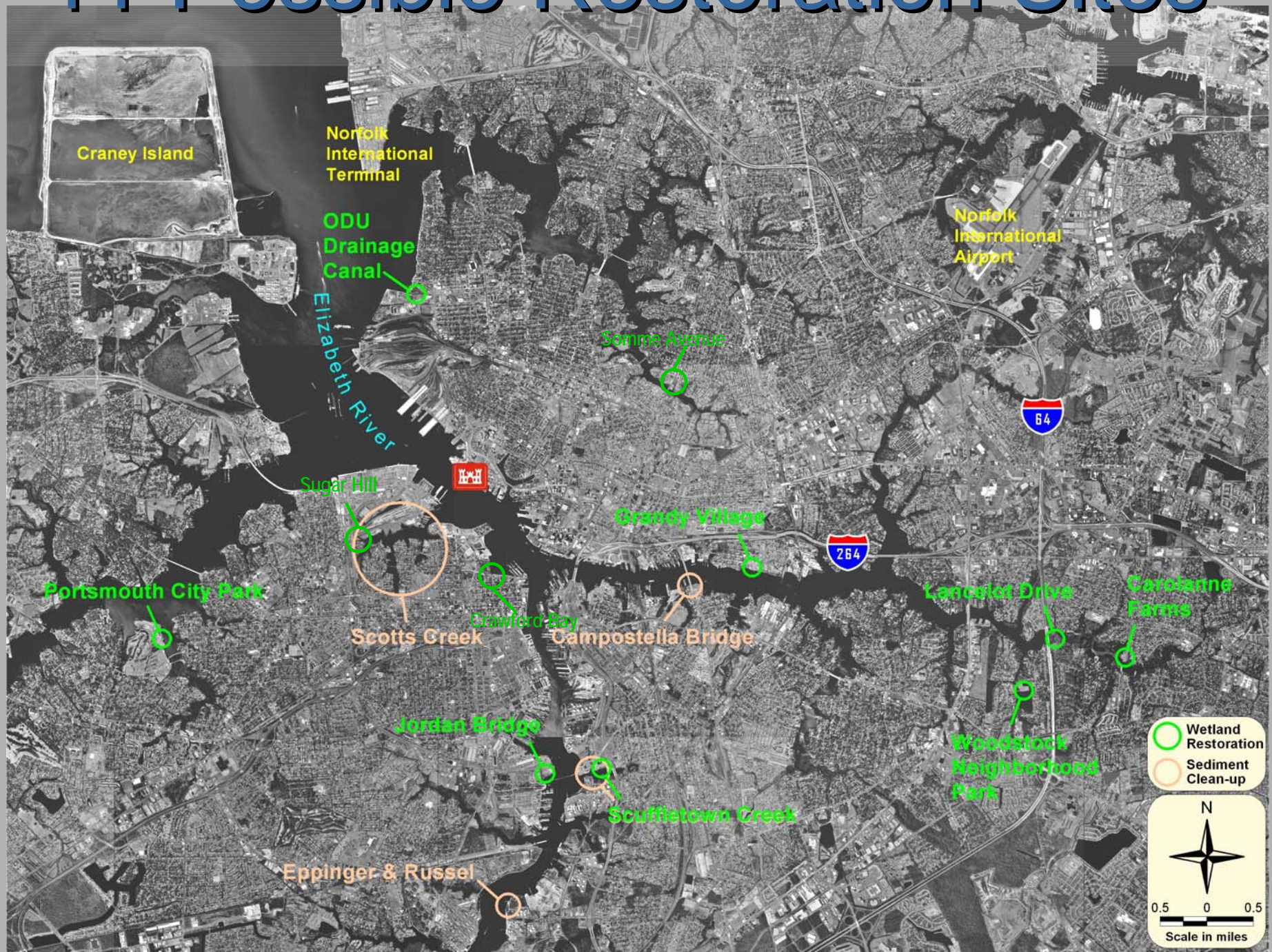
The Concepts

- **“Cost Effectiveness Analysis for Environmental Planning: Nine EASY Steps”**
 - IWR Report 94-PS-2 (www.iwr.usace.army.mil/)
- **“Procedures Manual: Cost Effectiveness and Incremental Cost Analyses”**
 - (IWR Report 95-R-1) (www.iwr.usace.army.mil/)
- **Planning Guidance (ER 1105-2-100)**
(www.usace.army.mil/inet/functions/cw/cecwp)

CE/ICA in Application: Elizabeth River



11 Possible Restoration Sites



Scuffletown Creek- existing



Scuffletown- proposed future



Environmental Benefits

- HEP on clapper rail
- Functional Assessment Score (*homegrown*)
 - primary production
 - fish & wildlife habitat
 - water quality
 - erosion buffer
 - flood buffer
 - aesthetics
 - public access & educational value

Project Costs

- Implementation costs
 - Site prep, earthwork, landscaping
 - maintenance
 - periodic monitoring
 - real estate, disposal
- Avg annual equivalent
 - 50-yr life, 6 3/8% discount rate, FY 2000 prices

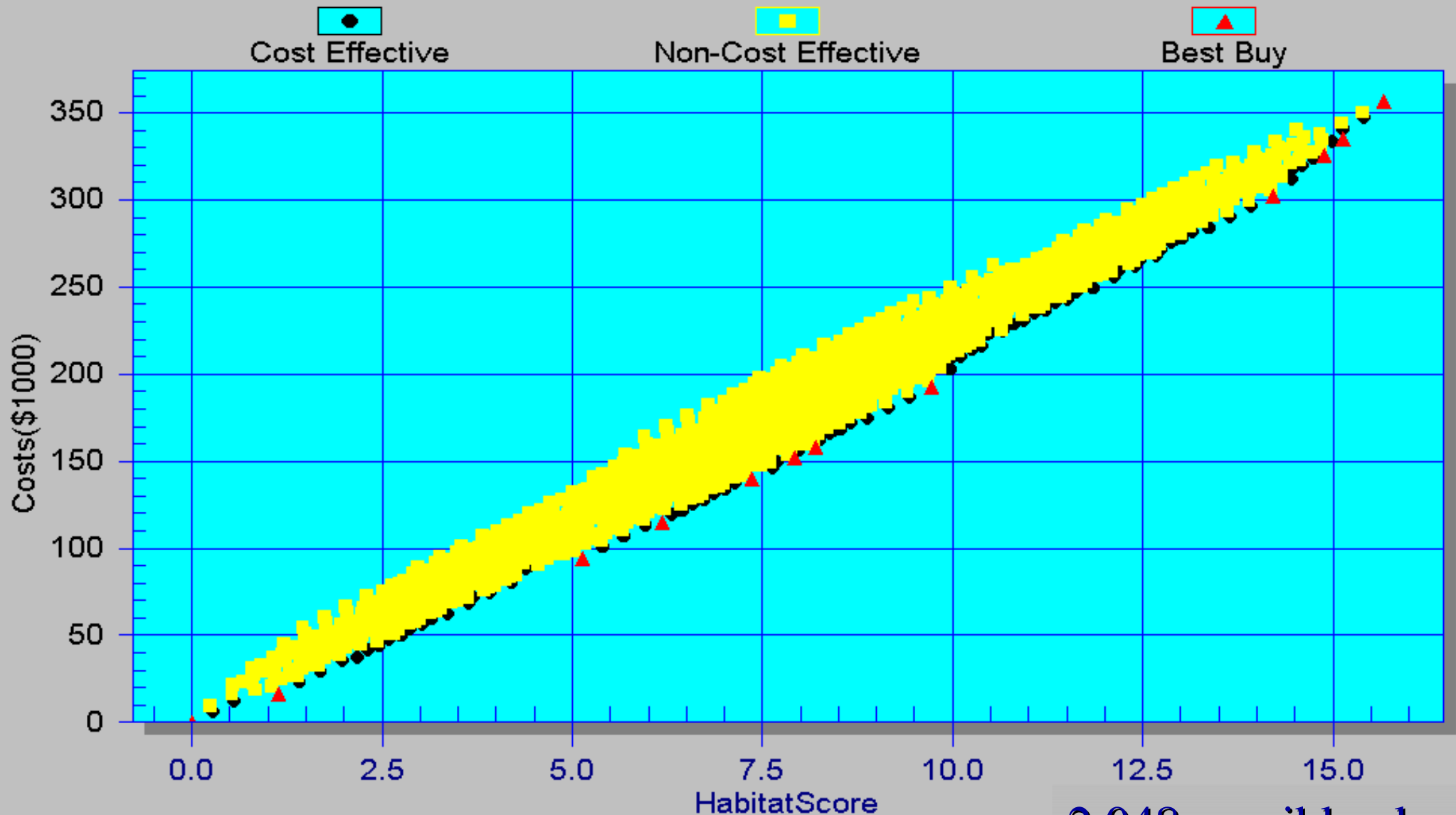
Elizabeth River: Input Data

Location	Total Implementation Costs	Average Annual Costs ¹	Annual Habitat Units (from HEP) ²	Annual Functional Assessment Score ²
Sugar Hill, Portsmouth	\$136,876	\$9,600	0.25	7.06
Carolanne Farms, VA Beach	\$297,431	\$20,700	1.05	32.54
Somme Avenue, Norfolk	\$308,610	\$21,400	0.54	14.75
Scuffletown, Chesapeake	\$87,781	\$6,200	0.28	6.92
NW Jordan Bridge, Portsmouth	\$237,564	\$16,500	1.14	31.61
Crawford Bay, Portsmouth	\$355,413	\$24,700	1.18	35.67
Woodstock Park, VA Beach	\$499,738	\$34,600	1.52	48.24
Lancelot Drive, VA Beach	\$1,583,079	\$109,400	4.49	133.25
Grandy Village, Norfolk	\$1,124,410	\$77,800	3.99	166.70
ODU Drainage Canal, Norfolk	\$175,795	\$12,300	0.56	18.76
Portsmouth City Park, Portsmouth	\$333,369	\$23,200	0.67	23.52
¹ Average annual equivalent costs derived using an interest rate of 6-5/8%.				
² Full realization of benefits is anticipated in year 3. Linear interpolation of benefits is assumed between years one and three.				

Elizabeth River: All Combinations

Elizabeth River Environmental Restoration

Wetlands Habitat Assessment - All Plan Combinations

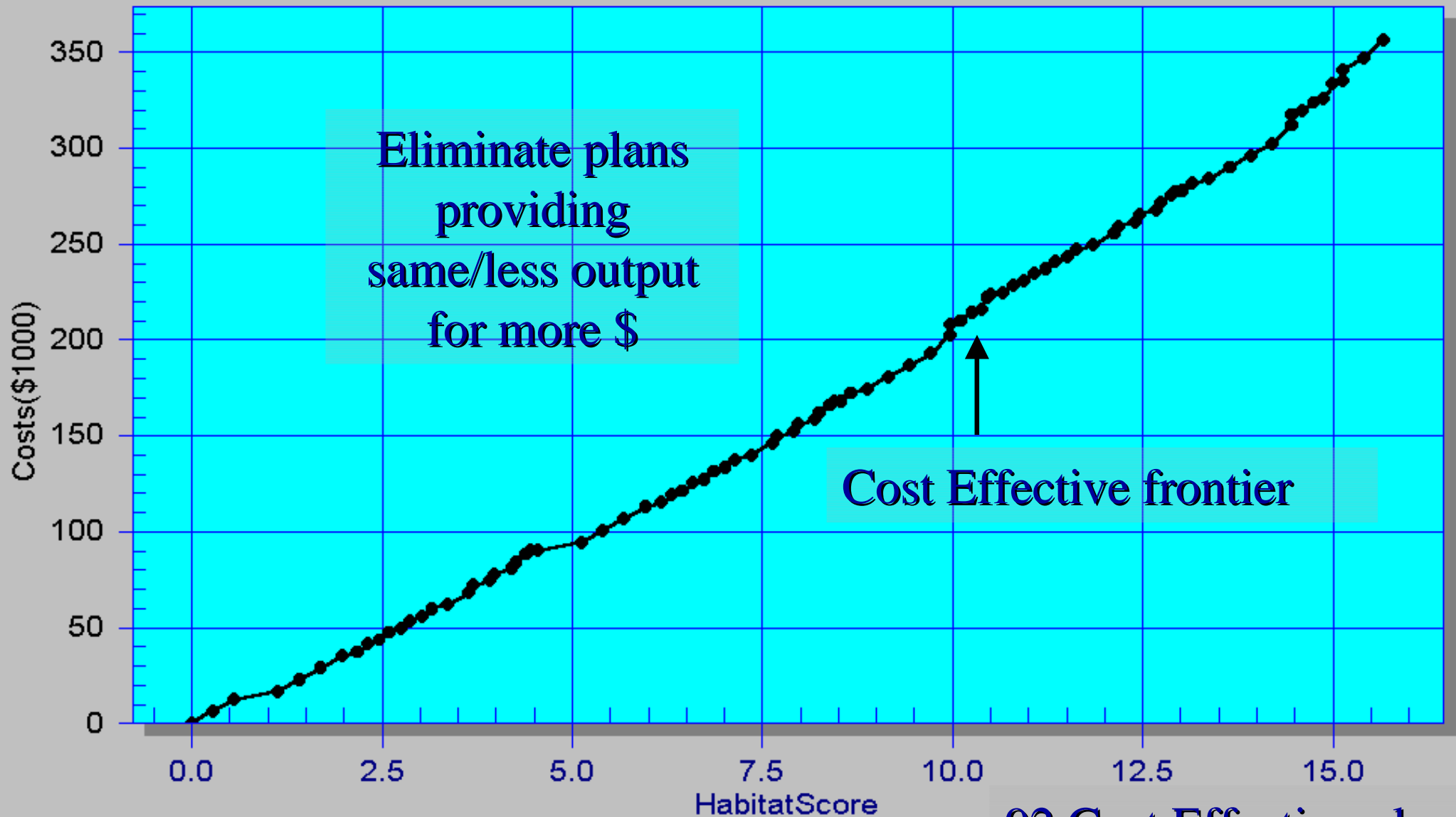


2,048 possible plans

Elizabeth River: CE Plans

Elizabeth River Environmental Restoration

Wetlands Habitat Assessment - Cost Effective Plans



92 Cost Effective plans

ICA Conceptually

- Assumption:

Doing something is better than doing nothing

- If so, where do we start?
- ICA helps determine which level of investment to do first
- Mathematically:
$$\text{Change in cost} / \text{Change in output}$$

ICA Graphically

Elizabeth River Environmental Restoration Cost Effective Sediment Clean-Up Levels

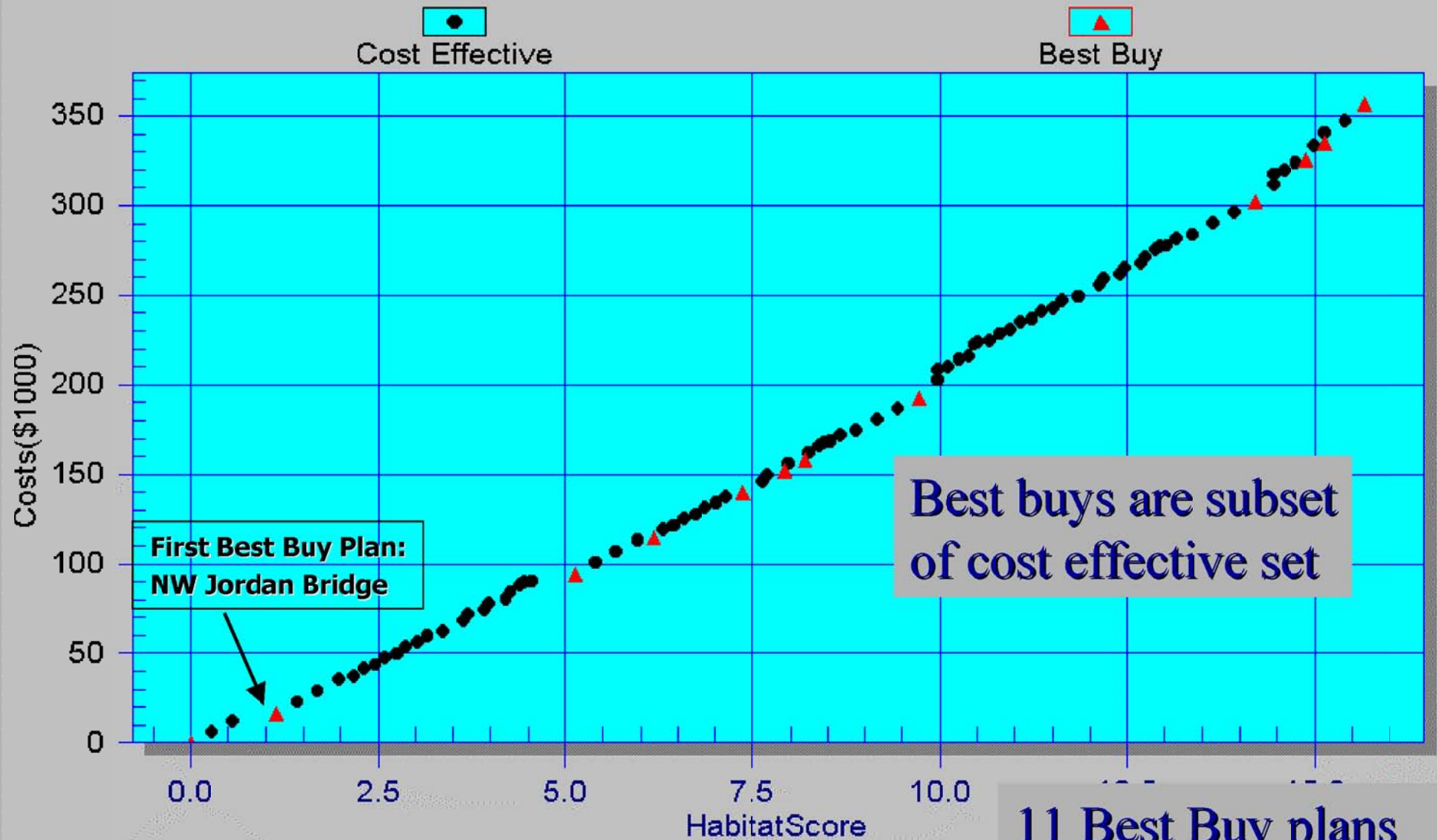


ICA: “Best Buy” Plans

- Most efficient in production
- Greatest increases in output for least increases in cost
- Lowest incremental costs per unit of output

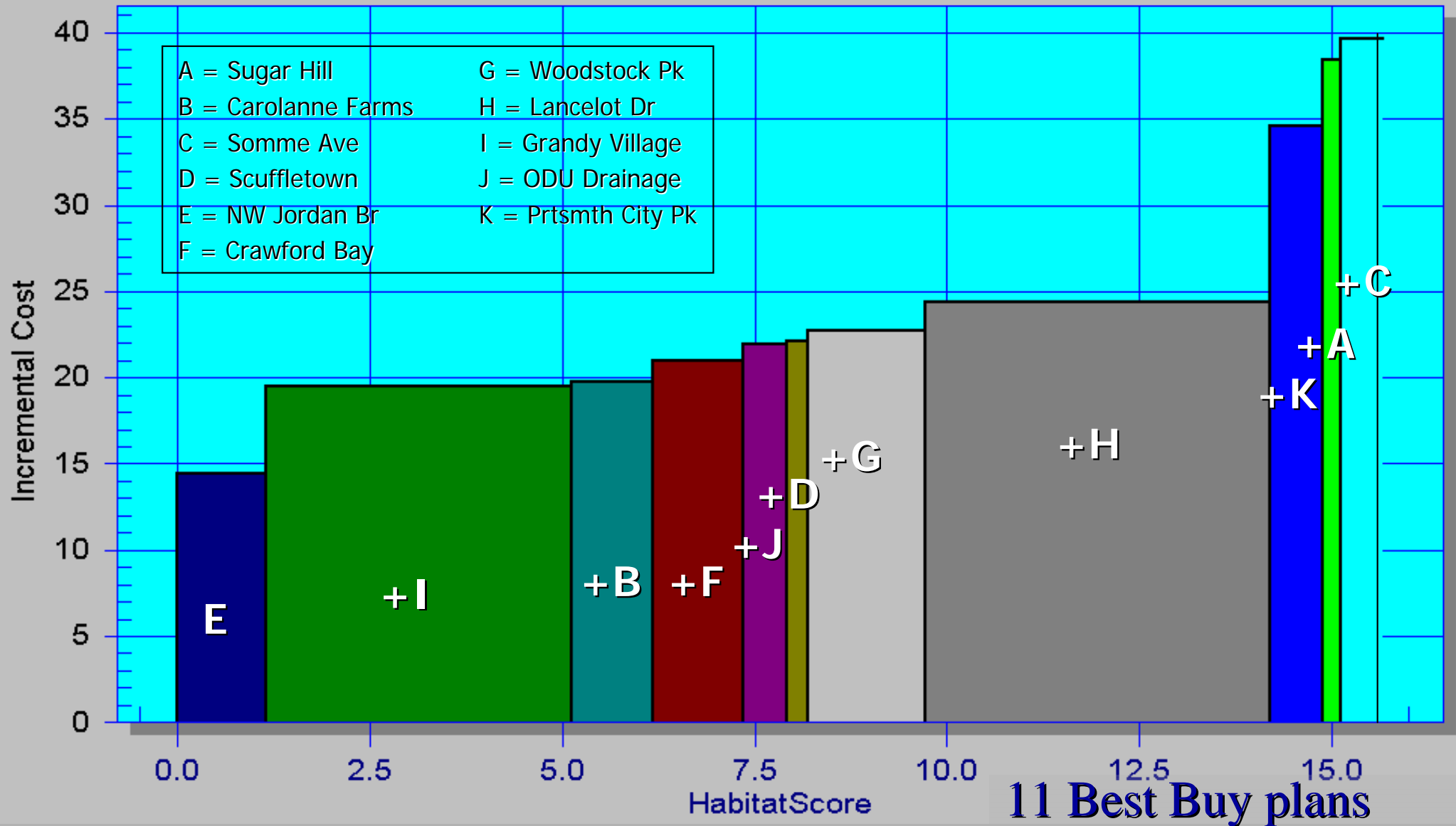
Elizabeth River: Best Buy Plans

Elizabeth River Environmental Restoration Wetlands Habitat Assessment - Cost Effective & Best Buy Plans



Elizabeth River: Best Buy Plans

Elizabeth River Environmental Restoration Wetlands Habitat Assessment - Best Buy Plans



IWR-Plan

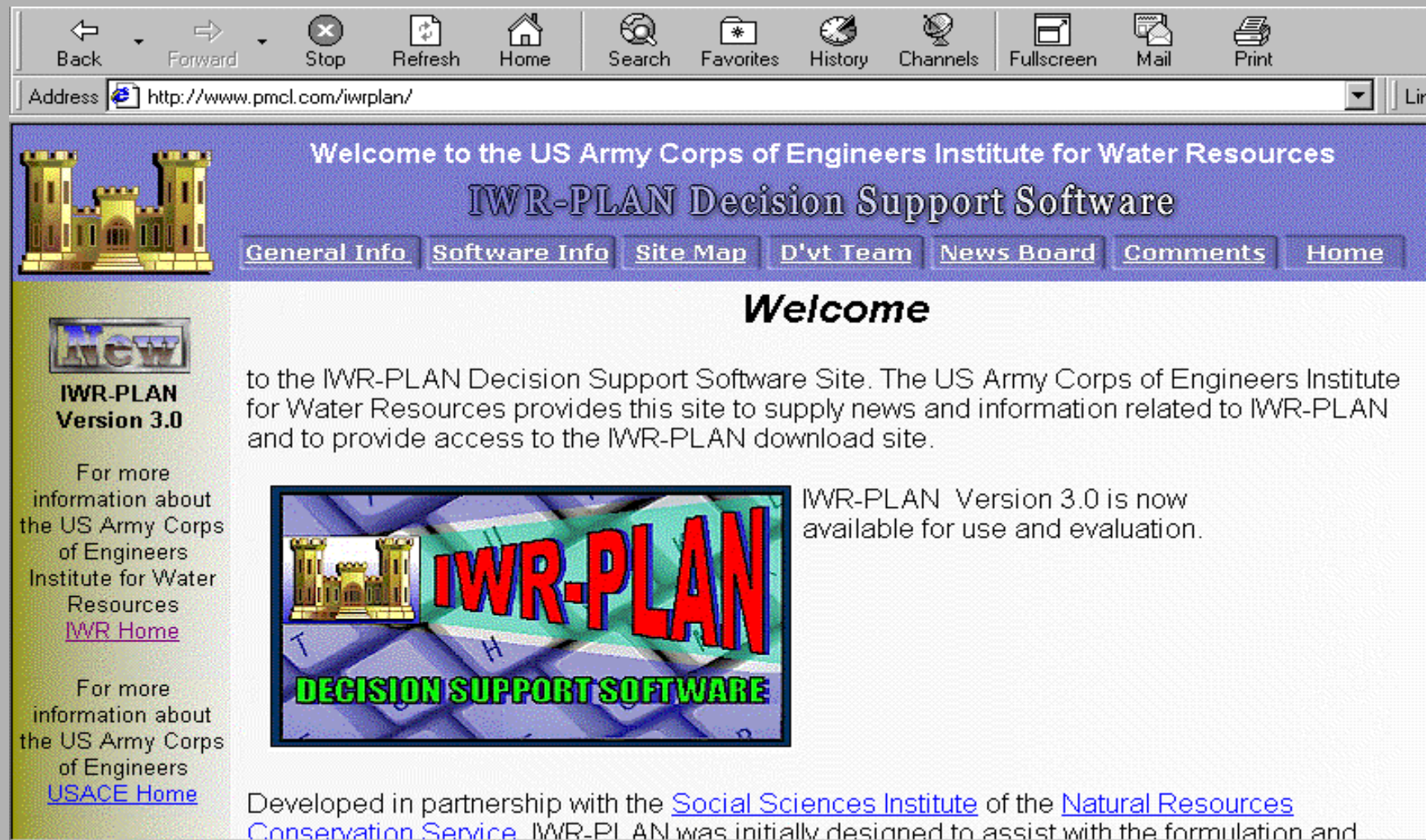
- Software version of CE/ICA
- Developed to automate tedious math
- Provides standard outputs
 - Graphs
 - tables



IWR-Plan Basics

- Assists in plan formulation
 - Builds all plan possibilities based on
 - Up to 26 solutions, 10 scales
 - Dependency & combinability relationships
- Up to 10 input variables (costs & outputs)

IWR-Plan Availability



The screenshot shows a Netscape browser window with the address bar displaying <http://www.pmcl.com/iwrplan/>. The browser's toolbar includes buttons for Back, Forward, Stop, Refresh, Home, Search, Favorites, History, Channels, Fullscreen, Mail, and Print. The website has a blue header with a castle icon on the left and the text "Welcome to the US Army Corps of Engineers Institute for Water Resources" and "IWR-PLAN Decision Support Software". Below the header is a navigation bar with buttons for General Info, Software Info, Site Map, D'vt Team, News Board, Comments, and Home. The main content area has a "Welcome" heading and a paragraph stating: "to the IWR-PLAN Decision Support Software Site. The US Army Corps of Engineers Institute for Water Resources provides this site to supply news and information related to IWR-PLAN and to provide access to the IWR-PLAN download site." To the left of this text is a sidebar with a "NEW" banner and the text "IWR-PLAN Version 3.0". Below this, it says "For more information about the US Army Corps of Engineers Institute for Water Resources" with a link to "IWR Home". Further down, it says "For more information about the US Army Corps of Engineers" with a link to "USACE Home". In the center of the main content area is a large graphic with the text "IWR-PLAN" in large red letters and "DECISION SUPPORT SOFTWARE" in green letters below it, with a small castle icon to the left. To the right of this graphic is the text "IWR-PLAN Version 3.0 is now available for use and evaluation." At the bottom of the main content area, it says "Developed in partnership with the [Social Sciences Institute](#) of the [Natural Resources Conservation Service](#). IWR-PLAN was initially designed to assist with the formulation and

www.pmcl.com/iwrplan

Questions?